

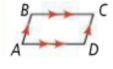
Chapter 6: Polygons

Section 3: Proving a Quadrilateral is a Parallelogram

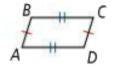
Theorem 6-8

Recall that theorem 6-3 states:

If ...
 $ABCD$ is a \square



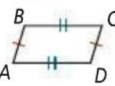
Then ...
 $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$



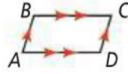
We saw the converse of that theorem yesterday. It's such an important concept it is a theory as well.

Theorem 6-8

If ...




Then ...
 $ABCD$ is a \square



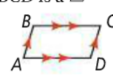
If both pairs of opposite sides of a quadrilateral are congruent then the quadrilateral is a parallelogram.

Theorem 6-9

If ...



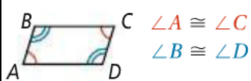
Then ...
 $ABCD$ is a \square



If an angle of a quadrilateral is supplementary to both its consecutive neighbors then the quadrilateral is a parallelogram.

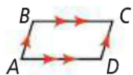
Theorem 6-10

If ...



Then ...

$ABCD$ is a \square



- If both pairs of opposite angles of a quadrilateral are congruent then the quadrilateral is a parallelogram.

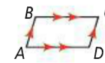
Theorem 6-11

If ...



Then ...

$ABCD$ is a \square



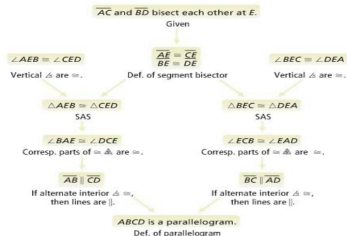
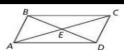
- If the diagonals of a quadrilateral *bisect* each other then the quadrilateral is a parallelogram.

Theorem 6-11

Proof of Theorem 6-11

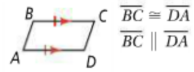
Given: \overline{AC} and \overline{BD} bisect each other at E .

Prove: $ABCD$ is a parallelogram.



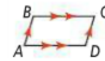
Theorem 6-12

If ...



Then ...

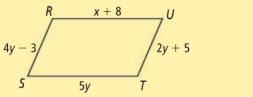
$ABCD$ is a \square



- If *one pair* of opposite sides of a quadrilateral is **both parallel and congruent** then the quadrilateral is a parallelogram.

Applying your knowledge

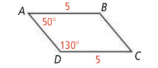
For what value of x must $RSTU$ be a parallelogram?



Applying your knowledge

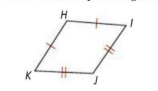
Given: $AB = 5$, $CD = 5$,
 $m\angle A = 50^\circ$, $m\angle D = 130^\circ$

Prove: $ABCD$ is a parallelogram.



Given: $\overline{HI} \cong \overline{HK}$, $\overline{JI} \cong \overline{JK}$

Prove: $HJKI$ is a parallelogram.



How can you prove a quadrilateral is a parallelogram?

Method

Prove that both pairs of opposite sides are parallel.

Prove that both pairs of opposite sides are congruent.

Prove that an angle is supplementary to both of its consecutive angles.

Prove that both pairs of opposite angles are congruent.

Prove that the diagonals bisect each other.

Prove that one pair of opposite sides is congruent and parallel.

Source

Definition of parallelogram

Theorem 6-8

Theorem 6-9

Theorem 6-10

Theorem 6-11

Theorem 6-12

Diagram

